



BPC

Broadening Participation
in Computing

<https://www.nsf.gov/cise/bpc/>

Rationale

- This is an important time in computing education – **interest is skyrocketing but limited by disproportionate representation** across segments of society.
- There is longstanding underrepresentation of various populations – including women, African Americans, Hispanics, American Indians, Alaska Natives, Native Hawaiians, Native Pacific Islanders, and persons with disabilities – in the computing field.

NSF & CISE are committed to Broadening Participation (BP)

“CISE will address BP programmatically both through focused activities and through **the inclusion of BP efforts as an accepted and expected part of its research and education award portfolios.**”

CISE BP Strategic Plan

https://www.nsf.gov/cise/oad/cise_bp.jsp

BPC is a community-wide effort

“It will take more than good intentions or business as usual, however, to reverse longstanding underrepresentation. It will take **committed, focused, and sustained efforts** on the part **of many** in the computing community.”

(Really, it should say: Efforts of ***almost all*** are required for change.)

CISE BP Strategic Plan

https://www.nsf.gov/cise/oad/cise_bp.jsp₄


Guiding Principles

- BP in Computing (BPC) requires **culture change** in colleges/universities, departments, classes, research groups, professional organizations & K-12.
- Culture change begins with **enhanced exposure** to BPC throughout the CISE community.
- PI engagement must be **tailored to individuals and/or organizations** as appropriate.

History

- **CISE Pilot Goal:** Greater engagement of CISE PIs in meaningful BPC activities
- **Fiscal Year (FY) 2017:** NSF 17-110, *Dear Colleague Letter: Pursuing Meaningful Actions in Support of Broadening Participation in Computing (BPC)*, announced new BPC pilot effort building on NSF/CISE's past BPC activities
- **FY 2018:** BPC plans encouraged for Expeditions in Computing and Cyber-Physical Systems (CPS) and Secure and Trustworthy Cyberspace (SaTC) Frontier submissions
- **FY 2019 – FY 2021:** BPC plans required by the time of award in Medium and Large proposals submitted to core programs, CPS, SaTC

Resources for Constructing a BPC Plan

- **BPCNet.org:** An evolving portal providing CISE researchers with BPC resources including scholarly papers, examples of best and promising practices, and options for partnering with existing, collective activities.
-  **White Paper on the CISE BPC Plan Pilot:** *Highly recommended* as a resource for CISE PIs. It describes the components of a good plan, how individuals can improve their BPC efforts and how reviewers might evaluate such plans. Available at BPCNet.org or https://www.nsf.gov/cise/bpc/White_Paper.pdf.

BPC Plan Scope

- BPC plans can range from a few paragraphs to 3 pages.
- A good **BPC plan should include the following:**
 - **Target:** Demographics of intended population(s) including the interests and challenges they bring to computing;
 - **Context:** Problem is addressed and rationale for the approach and goals;
 - **Strategies:** Details of planned activities and necessary resources; and
 - **Measurement and Dissemination:** Metrics and plans for dissemination of outcomes.
- Also prior experience and/or intended preparation/training activities (if any).

Effective BPC Plans: Collective Action

Often the most effective plans do not propose new activities but join ongoing, successful activities, partnering with existing organizations or activities at the department, university (e.g., AGEF or LS-AMP programs), local (e.g., district school teachers), regional (e.g., regional Grace Hopper Conferences) or national levels (e.g., Girl Scouts or 4H).

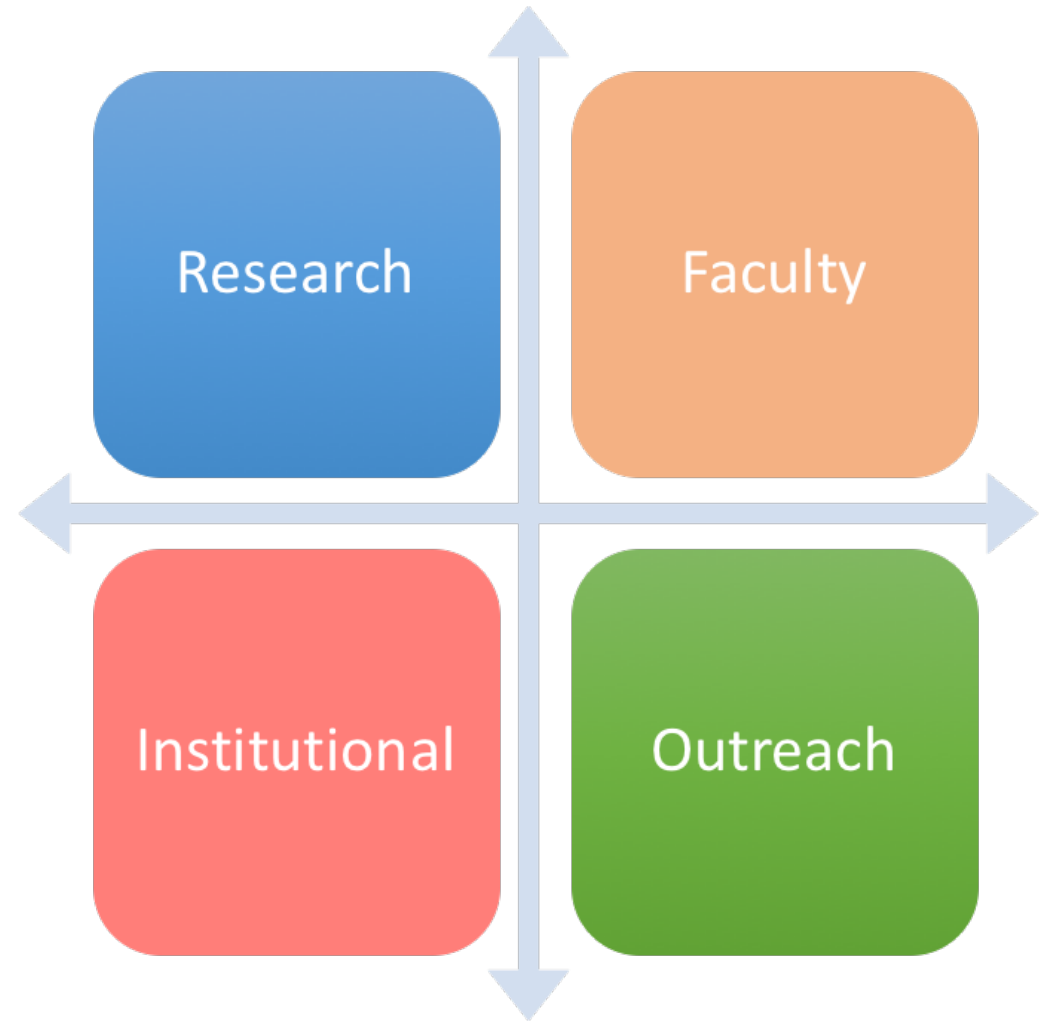
Project team members, including faculty, graduate and undergraduate students, can all participate in the activities.

Check out BPCNnet.org for more examples of collective BPC efforts to join.

Multiple Approaches to BPC

Any BPC plan should include **meaningful activities** in which a PI can engage. Efforts can be aligned with research, faculty, institutional, and/or outreach activities.

NOTE: BPC activities do not have to be related to the primary research of the proposal.



Examples of Research-Related Activities



Research

- With your project team, explore ways (seminars, webinars, articles, etc.) to make your research group more inclusive; implement appropriate changes.
- Become a faculty mentor for an undergraduate researcher from an underrepresented group, including NSF-funded Research Experiences for Undergraduates (REUs), with support for the recruitment and retention of such researchers.
- Advocate with organizing committees for increased diversity in technical conferences/workshops/summer schools; recruit diverse student attendees to these events and shepherd/mentor them once there.
- Sponsor students from the underrepresented groups to attend diversity-focused conferences (e.g., Grace Hopper or Tapia); help them prepare for the conference and debrief their peers on their return.

Examples of Faculty Activities

Faculty

- Participate in professional development of diversity awareness and inclusive teaching.
- Sponsor prominent speakers from groups typically underrepresented in computing to address faculty and students.
- Provide training, mentoring, networking, and leadership opportunities for students and peers in groups typically underrepresented in computing.
- Develop and disseminate pedagogy tools focused on unique social/cultural experiences of students in groups typically underrepresented in computing.
- Encourage entrepreneurial efforts of students from underrepresented groups in classes or research e.g., by connecting them to on-campus resources/mentors.

Examples of Institutional Activities



Institutional

- Work with your department to develop/implement a BPC plan,
- Work with AGEP, LSAMP or other diversity programs on your campus.
- Plan a faculty workshop to focus on equity and inclusivity.
- Sponsor a department journal club on diversity and inclusion.
- Build a support community and organized activities for students in groups typically underrepresented in computing in your local universities and community colleges.
- Support teachers serving populations of predominantly underrepresented groups in local community colleges/high schools.

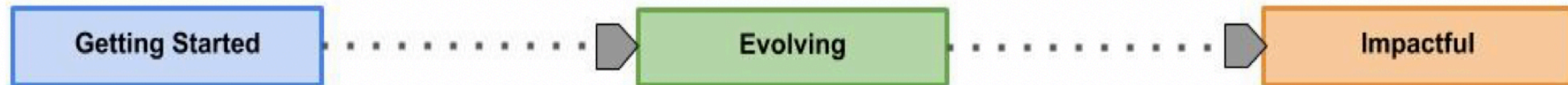
Examples of Outreach Activities

Outreach

- Organize undergraduate and graduate students, including those in underrepresented groups, to visit K-12 classrooms.
- Offer training opportunities for teachers who serve predominantly underrepresented groups in local community colleges/high schools.
- Become a mentor/trainer in a national coding project; host a summer coding camp aimed at attracting students in groups typically underrepresented in computing.
- Participate in a project run by one of the NSF-funded INCLUDES projects or CISE BPC Alliances working with individuals in groups typically underrepresented in computing. See BPCNet.org and https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503593.

Not everyone is expected to be an expert on BPC

The expectation is that PIs will develop expertise and experience, allowing them over time to move from “Just Getting Started” to activities that are “Impactful.”



Note: the following are intended to be illustrative of the elements that should be in a BPC plan, rather than exemplars of ideal plans. Due to space limitations they may omit some specifics that would be part of a quality plan. Meaningful BPC plans need not be about conducting research on BPC.

Research

Example of Abridged BPC Plan

[Context and target] Currently, only 13% of those employed in machine learning and artificial intelligence (AI) activities are women. Further, in the next two years, there is a predicted 10% decrease in female student enrollment in undergraduate AI programs.

[PI or Team qualifications] To help address this disparity, the PI has been actively mentoring both undergraduate and graduate students from underrepresented groups for the last five years. Four of her 11 doctoral students have been women. The PI also initiated and has since maintained a research collaborative in 2013 named ALICE with a private business leader in artificial intelligence to focus on introducing AI research to women and minorities through collaborative undergraduate research projects.

[Specifics of the plan] The ALICE program will be involved in broadening participation in the current project by jointly recruiting 10 female undergraduate research interns who will work with the PI and ALICE program staff for 15 weeks on research projects. This will provide an opportunity for undergraduate student participants to learn and be introduced to AI in both a research and business setting. The setting provides a way to teach them about the exciting field of AI and support diversity within the growing AI field.

[Measurement & Dissemination] During the program, the PI will work closely with ALICE's team to assess program impact through descriptive information on the interns, their time spent participating in assigned projects, participant self-reported knowledge and attitudes about AI work, and information from the projects. The knowledge gained will allow the PI to investigate future projects to attract a broader undergraduate research applicant pool.

Example of Abridged BPC Plan

[Context and target] Unfortunately, the percentage of women in the computer science (CS) field has been declining since the 1980s (35% of declared CS majors being women in 1985, as compared to 18% in 2014). While 51% of the students at our university are women, only 20% of our CS undergraduates are women, a percentage that has increased over the last decade but only very slowly.

[PI or Team qualifications] Understanding the importance of women in the CS field, the PI is actively involved with various local and national research opportunity programs, such as the National Research Opportunity for Women in Science Program (NROWS), and Undergraduate Research Opportunity for All (UROA) (*See NROWS support letter*).

[Specifics of the plan] The PI will participate in an extensive 1-year NROWS professional development program on diversity-awareness and inclusive teaching that will take place over a 2-day time period, recurring monthly, at the NROWS headquarters in Washington D.C. (*See suppl. document 1*). Twelve topics will be covered ranging from “effective intercultural communication” to “countering stereotype threat and imposter syndrome.” Funds have been set aside within the budget (*See budget justification*) for the PI to travel and participate in the program. After completion of the NROWS program the PI will develop and offer a free faculty/student diversity-awareness seminar series on a monthly basis for the course of 6 months (*See college support letter*).

[Measurement & Dissemination] To assess impact of the PI’s seminar series, the PI will monitor series attendance (demographics of the students and faculty present, student-faculty participant ratio) and collect feedback from the participants after each seminar. The feedback will be compiled and used for future diversity-awareness seminar series the following year. The knowledge gained will allow the PI to tailor projects to the desires of the research community and attract new participants to the field.

Example of Abridged BPC Plan

[Context and target] Currently, only 24% of our undergraduate student population in our computer science program is from underrepresented minority groups. These numbers drop dismally when looking at graduate enrollees (11%) and faculty (two women of 36 faculty members).

[PI or Team qualifications] To address these disparities, the PI will participate in the development a departmental plan at broadening participation in computing. This idea has already received support from the departmental chair and dean (see letters of support). The PI was recently hired in part of an effort to grow the department in both size and diversity. The PI has spent her time in graduate school building her research portfolio, but also learning how to effectively teach and mentors students from underrepresented groups.

[Specifics of the plan] The departmental plan will be developed over an 18 month period in conjunction with departmental and university leadership, faculty and experts in STEM education. The plan will target effectively growing the diversity of both the students and the faculty. The plan will include the development of supportive networks for students.

[Measurement & Dissemination] The PI will work with colleagues in the school of education to develop an evaluation plan to assess the impact of the plan on recruitment of students and faculty and interviews with potential and current members of the department.

Example of Abridged BPC Plan

[Context and target] Given the underrepresentation of women and underrepresented minorities entering the computer science workforce, the PIs will improve research training and advance the careers of members of underrepresented groups by focusing on outreach in robotic technology. While robotics is not always a popular topic for women or minorities, the goal here is to encourage their participation with a activity focused on robotics for social good.

[PI or Team qualifications] The investigators will build on their longstanding outreach program (2010 to present), which offers day-long tutorials on haptic and robotic technology for high school, community college and non-computer science major undergraduate students. The PI has had success in advising minority student organizations (including NSBE and ACM-W Chapters) and in organizing events to support women in the sciences, including a Regional Grace Hopper conference.

[Specifics of the plan] The team will increase recruitment efforts to include a broader range of student groups on campus. The monthly robotics program will provide a fun and educational activity in developing a robot with a specific task with a focus on applications for social good. Students will choose among several topics, develop prototypes of the robot and create code to support the chosen task. In addition, the team will create a website to facilitate additional pre- and post outreach activities,

[Measurement & Dissemination] The PIs will use pre- and post-surveys to track student demographics, motivations for participating, and resulting changes in attitudes toward computing and computing careers.

BPC

- BPC is a community-wide responsibility and this pilot effort represents an effort to rethink how CISE-funded research and educational activities can incorporate this goal in a pervasive manner.
- Pilot activities should:
 - Be intentional;
 - Be ongoing and integral parts of funded projects; and
 - Include measurement & dissemination.

 **Read the BPC White Paper!**

<https://www.nsf.gov/cise/bpc/>

